[0022] The drive arm may include a coupling portion which includes a section of the shaft wall having a divergent-convergent diametric profile in the downstream direction.

[0023] The support shaft may be formed in part by a portion of the low pressure shaft which passes through the sun gear.

[0024] The support shaft may extend beyond the low pressure shaft in the downstream direction.

[0025] The low pressure shaft and fan shaft may be separated by an intershaft bearing arrangement which is located upstream of the gearbox.

[0026] Within the scope of this application it is expressly envisaged that the various aspects, embodiments, examples and alternatives, and in particular the individual features thereof, set out in the preceding paragraphs, in the claims and/or in the following description and drawings, may be taken independently or in any combination where technically compatible, unless otherwise stated.

DESCRIPTION OF DRAWINGS

[0027] Embodiments of the invention will now be described with the aid of the following drawings of which:

[0028] FIG. **1** shows convention gas turbine engine as described above in the background section.

[0029] FIG. **2** shows a schematic section of a geared turbo fan arrangement.

[0030] FIG. **3** shows a partial section of a geared turbo fan shafting arrangement.

[0031] FIG. **4** shows an alternative arrangement of a geared turbo fan shafting arrangement.

[0032] FIG. **5** shows a yet further alternative arrangement of a geared turbo fan shafting arrangement.

[0033] FIG. **6** shows another alternative arrangement of a geared turbo fan shafting arrangement.

[0034] FIG. **7** shows a further alternative arrangement of a geared turbo fan shafting arrangement.

DETAILED DESCRIPTION OF INVENTION

[0035] FIG. **2** shows a geared gas turbine engine **210** having low and high pressure spools, each having respective compressors and turbines driveably interconnected by respective shafts. Thus, there is a low pressure compressor **216** connected to the low pressure turbine **218** via a low pressure shaft **220**, and a high pressure compressor **222** connected to a high pressure turbine **224** via a high pressure shaft **226**. The low **216** and high **222** pressure compressors progressively compress air from an inlet downstream of a fan **212** to an outlet in flow proximity to the combustor **228**. Compressed air flows from the high pressure compressor **222** to the combustor **228** in which fuel is added to the air and the mixture burnt. The combusted air then expands through the high **224** and low **218** pressure turbines in flow series. The low **220** and high **226** pressure shafts interconnecting the respective turbines and compressors provide the drive for the compressors.

[0036] The fan **212** is foremost so as to be located at the front of the engine **210** and receive air direct from the engine intake, providing it for the inlet of the compressors and the main propulsive flow down the bypass duct **230**. The fan **212** is driveably connected to the low pressure shaft **220** via a gear train **232** in the form of an epicyclic reduction gear box. The gear train **232** is located between the low pressure shaft **220** and the fan **212** and is arranged to reduce the speed of the fan **212** relative to the speed of the low pressure turbine **224**. Such an arrangement allows for a higher speed and more efficient low pressure turbine **218**, and slow spinning larger fan which can provide a higher bypass ratio. This freedom allows the speed of the fan and low pressure turbine to be independently optimised.

[0037] The fan **212** has a plurality fan blades **234** extending radially from a hub **236** which is mounted so as to rotate about the principle axis of the engine **210**. The fan **212** resides within a fan casing **214** which partially defines the bypass duct **230**. An engine casing **238** surrounds the engine core which comprises the low and high pressure spools and combustor **228**. The engine casing generally provides containment and structural support for the engine core. The engine casing **238** is ultimately attached to and supported by the wing of the aircraft via an appropriate arrangement of struts **240** which extend across the bypass duct **230** and the nacelle which attaches to a pylon as is well known in the art.

[0038] The gear train **232** is in the form of an epicyclic reduction gearbox which is driven in a planetary configuration. The gear train **232** includes a ring or annular gear which is held substantially stationary in relation to the engine, a planet gear set with individual planets gears interconnected via a carrier, and a sun gear. The sun gear is rotatably connected to the low pressure shaft. The fan is connected to the output shaft of the gearbox which is in the form of the carrier of the planet gear via a fan shafting arrangement **242**.

[0039] The fan shafting arrangement **242** is rotatable about and in some part defines the principal axis **244** of the geared gas turbine engine **210** and is supported by two axially separated bearings. Thus there is a front bearing **246** provided forward of the gear train **232** with respect to the flow direction of the engine, and a second bearing **248** positioned aft of the gearbox **232**.

[0040] As will be seen from the following FIGS. **3** to **7**, the fan shafting arrangement **242** typically comprises a fan shaft **312** which is independently rotatable from the low pressure shaft **358** by virtue of an intershaft bearing or by being coupled directly to the engine casing via a direct support which does not include the low pressure shaft. In some embodiments, the shafting arrangement may include a portion of the low pressure shaft as per FIG. **5** which is described below. A notable feature of the shafting arrangement is that it has a support shaft which passes through the sun gear of the reduction gear.

[0041] FIG. **3** shows a first fan shafting arrangement **310** in more detail. The shafting arrangement **310** includes: a fan shaft **312**; a hub portion **320**; a front bearing portion **314** which carries the front bearing **356** so as to radially support the fan shaft **312** via a support structure **322**; a drive arm **316** which is attached to the carrier of the gear box and provides the drive for the fan, and a support shaft **318** which extends through the sun gear.

[0042] The gear train is an epicyclic reduction gearbox having a sun gear **324**, planet gears **326** which are connected by a carrier **328**, and a ring gear **330** which is secured to the engine structure via a ring gear support arm **332**. The gearbox is held within a housing defined by fore **334** and aft **336** walls which extend radially from the engine casing **338** and terminate in bearings **340**, **342** which engage with respective fore **344** and aft **346** portions of the drive arm **316**.